Suggested problems

Chapter 19

The quiz questions will be same or very similar to the following text-book problems.

Refer to the course website for the latest version of this document.

You are encouraged to seek the help of your instructor during his office hours.

**8.** Compute **(a)** the number of moles and **(b)** the number of molecules in 1.00 cm3 of an ideal gas at a pressure of 100 Pa and a temperature of 220 K

**Answer:** (a) 5.47 10 mol ; (b) 3.29×1016 molecules

**19.** **(a)** Compute the rms speed of a nitrogen molecule at 20.0 °C. The molar mass of nitrogen molecules (N2) is given in Table 19-1. At what temperatures will the rms speed be **(b)** half that value and **(c)** twice that value?

**Answer: (a**) 511m/s ; (b) 73.3 K = -200 °C ; (c) 1.17 10 K = 899 °C

**44.** One mole of an ideal diatomic gas goes from a to c along the diagonal path in Fig. 19-25. The scale of the vertical axis is set by pa = pb = 5.0 kPa and pc = 2.0 kPa, and the scale of the horizontal axis is set by Vb = Vc = 4.0 m3 and Va = 2.0 m3. During the transition, **(a)** what is the change in internal energy of the gas, and **(b)** how much energy is added to the gas as heat? **(c)** How much heat is required if the gas goes from a to c along the indirect path abc?

**Answer:** (a) −5.0 kJ ; (b) +2.0 kJ; (c) +5.0 kJ

**46.** Under constant pressure, the temperature of 2.00 mol of an ideal monatomic gas is raised by 15.0 K. What are **(a)** the work W done by the gas, **(b)** the energy transferred as heat Q, **(c)** the change ∆Eint in the internal energy of the gas, and **(d)** the change ∆K in the average kinetic energy per atom?

**Answer:** (a) +249 J ; (b) +623 J; (c) +374 J ; (d) +3.11×10−22 J

**57.** The volume of an ideal gas is adiabatically reduced from 200 L to 74.3 L. The initial pressure and temperature are 1.00 atm and 300 K. The final pressure is 4.00 atm. **(a)** Is the gas monatomic, diatomic, or polyatomic? **(b)** What is the final temperature? **(c)** How many moles are in the gas?

**Answer:** (a) diatomic ; (b) 446 K; (c) 8.10 mol.

**63.** Figure 19-27 shows a cycle undergone by 1.00 mol of an ideal monatomic gas. The temperatures are T1 = 300 K, T2 = 600 K, and T3 = 455 K. For 1$\rightarrow $2, what are **(a)** heat Q, **(b)** the change in internal energy ∆Eint, and **(c)** the work done W? For 2$\rightarrow $3, what are **(d)** Q, (e) ∆Eint, and **(f)** W? For 3$ \rightarrow $1, what are **(g)** Q, **(h)** ∆Eint, and **(i)** W? For the full cycle, what are **(j)** Q, **(k)** ∆Eint, and **(l)** W? The initial pressure at point 1 is 1.00 atm (= 1.013×105 Pa).What are the **(m)** volume and **(n)** pressure at point 2 and the **(o)** volume and **(p)** pressure at point 3?

**Answer:** (a) +3.74 kJ ; (b) +3.74 kJ ; (c) zero ; (d) zero ; (e) −1.81 kJ ; (f) +1.81 kJ ; (g) −3.22 kJ ;

 (h) −1.93 kJ ; (i) −1.29 kJ ; (j) +0.519 kJ ; (k) zero ; (l) +0.519 kJ ; (m) 0.0246 m3 ;

 (n) 2.026×105 Pa = 2.00 atm; (o) 0.0373 m3 ; (p) 1.013×105 Pa = 1.00 atm